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PRELIMINARY STUDIES ON THE MOON.

By F. A. MARLATT, Manhattan, Kan.

WHILE the moon has been a favorite field of study not only for the astronomer but for every lover of nature for centuries, the history that is written all over her surface has been misread by all, if my interpretation of it be the correct one; and as to that I will leave the Academy to judge.

Let us look for a moment at a brief outline of the present theory of the formation of our solar system.

Without going into details, it is supposed that two immense dead suns wandering through space met in such a way that either one or both of them were reduced to fragments, and that these fragments filled the space now occupied by our present solar system.

In time, by the law of attraction, the larger bodies attracted the smaller ones and the largest became our sun, and the other larger fragments developed according to the laws of momentum and attraction into the planets as we now know them.

By this coming together heat was produced, the larger masses becoming very much hotter than the smaller ones, by reason of the mass, and in time this heat was and is radiated into space, till we have the system in its present condition.

That this chaotic condition did exist at the first, and that our system was made up from these fragments of former suns, is clearly enough proven by the meteors that are seen to plunge into our atmosphere every night, many of them to be consumed by frictional heat before reaching the earth, and the few that do reach the earth are found to be of the same elemental composition as that of our planet, thus showing a common origin.

So far we may agree with the theory, as it certainly is in harmony with all of the records that are about us so far as we have been able to read them, and exactly coincides with the deductions that called forth this paper.

According to the present theory, the landscape as we know it is the result of cooling, shrinking and wrinkling, and thus producing oceans, valleys and mountains, and volcanoes are supposed by some to be vents from the molten interior.

According to this theory, the larger the mass the rougher

will be the surface; and the converse, the smaller the mass the smoother the surface. Thus the earth should be very rough, and the moon should present a surface as smooth as a ball.

The facts, however, are almost the reverse.

That I may make no mistake in presenting the present theory, I will quote Dr. Percival Lowell, of the Lowell Observatory, Flagstaff, Ariz., from his article in the November *Century*.

"Turning now to the moon, the first thing that strikes us on observation is the glaring exception to the order of smoothness, earth, Mars, moon, seemingly made by the latter. The lunar surface is conspicuously rough, pitted with what are evidently volcanic cones of enormous girth and of great height, and seamed by ridges more than the equal of the earth's in elevation. Many lunar craters have ramparts 17,000 feet high, and some exceed in diameter 100 miles; while the Leibnitz range of mountains, seen in profile on the lunar limb, rise nearly 30,000 feet in the air, or rather into space, as the moon has no atmosphere."

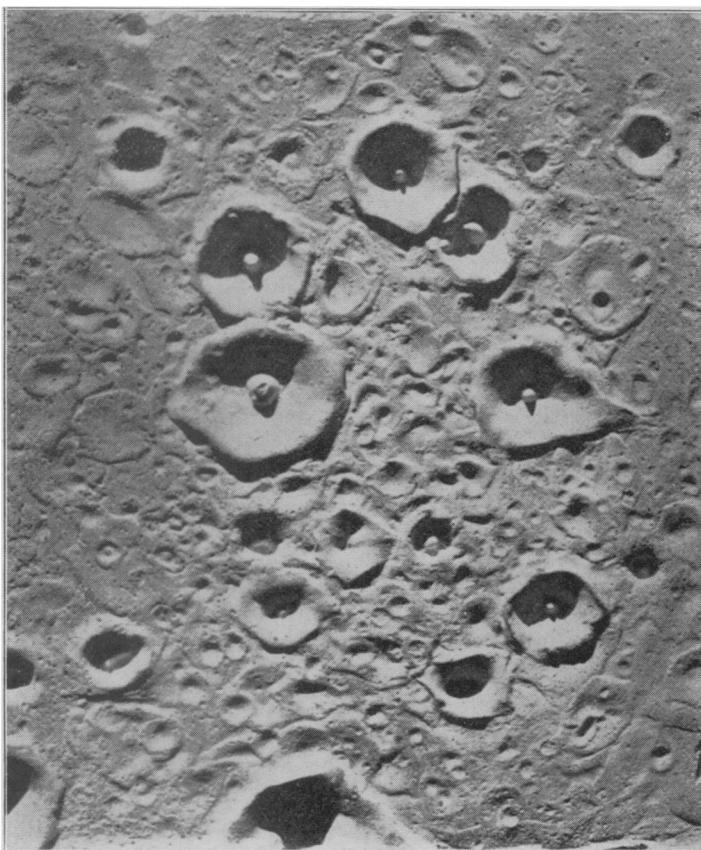
"On the principle that the internal heat to cause contraction was as the body's mass—and no physical deduction is sounder—this state of things on the surface of our satellite is unaccountable. The moon should have a surface like a frozen sea, and it shows one that surpasses the earth's in shagginess."

It is right here that my deductions conflict with all of the present theories as to the cause of the roughness of the moon's surface.

I claim that the moon has no mountains or volcanoes such as we know here on the earth—that is, produced by internal force—but that its present roughened surface was produced by external forces and by these alone.

The law of liquids obtains throughout the universe, so what we may see and demonstrate in them here and now must have occurred under like conditions when the moon was formed.

Whatever the origin of the moon may have been, it is evident that it was at one time a molten mass, else it could not have assumed the globular form; and also it must have attained this shape and started to cool before all the fragments that made its present mass were finally attracted to it, just



Photograph of semi-fluid plaster on which pebbles were thrown just prior to its setting.

as some of the yet remaining fragments are still coming to us in meteors and meteorites.

Now, everyone has noticed that a pebble dropped into a pool of water will produce a series of concentric waves, and, as the displaced water returns over the pebble, a little cone is raised, which subsides again, as do also the waves. Now, if this experiment be tried in a semiliquid, the first wave will go but a short distance and retain its wave shape, and the central cone will rise but not subside as in water, and the less fluid the substance, the more marked will be the result.

This, I claim, is just what happened on the moon. As it began to cool, the belated fragments came plunging into it

and produced the markings that we can see even with the unaided eye, as well as all the others that are revealed by the aid of the telescope.

The larger fragments, plunging in earlier in the stage of cooling, produced the large, uneven lower areas called sea bottoms, and later the smaller ones entering the less fluid mass produced the so-called craters which are seen to overlap each other just as they would do if produced in the manner described.

If we take plaster of paris and mix it so that it will not set too quickly, and then throw in various-sized shot or marbles just before and during the time of setting, we can make a very good map of any portion of the moon's surface.

Some may ask why the earth does not present the same features as the moon, for certainly it was subjected to a like bombardment of these fragments while it was cooling, and should show an even rougher surface than the moon.

In answer to this it may be said that the moon, having no air and being devoid of water, has retained all of its original features just as they were when finally cooled. The earth, on the other hand, has been subjected to the combined action of water and climatic changes, so that for thousands of feet below the present surface, all that we know of it, in fact, has been worked over and over again, and so leveled down till all of the original features have been obliterated.